Aranya Saha

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Research Interests

Multimodal Learning | Image/Video Processing | Efficient and Trustworthy LLM | RF Sensing | Theoretical Deep Learning

Education

BSc **Bangladesh University of Engineering and Technology (BUET)** *March 2025*
Department: Electrical and Electronic Engineering (EEE)
Major: Communication and Signal Processing (CSP)

- **CGPA: 3.87/4.00** **Rank:** 3rd in CSP Major (Top 5%)
- **Relevant Coursework:** Artificial Intelligence and Machine Learning, Random Signals and Processes, Digital Image Processing, Linear Algebra, Probability and Statistics, Computer Programming, etc.

Publications

* = Equal Contribution, **[P]** = Preprint, **[C]** = Conference, **[J]** = Journal

1. **[P]** I. N. Swapnil*, **A. Saha***, T. A. Khan*, M. A. Haque, *"GRPO++: Enhancing Dermatological Reasoning Under Low-Resource Settings"*, Under Review at *IEEE Journal of Biomedical and Health Informatics*. *[Preprint]*

2. **[P]** **A. Saha***, T. A. Khan*, I. N. Swapnil*, M. A. Haque, *"CLARIFY: A Specialist–Generalist Framework for Accurate and Lightweight Dermatological Visual Question Answering"*, Under Review at *IEEE Transactions on Human-Machine Systems*. *[Preprint]*

3. **[P]** T. A. Khan, **A. Saha**, I. N. Swapnil, M. A. Haque, *"Compression Strategies for Efficient Multimodal LLMs in Medical Contexts"*, Under Review at *Journal of Signal Processing Systems (Springer)*. *[Preprint]*

4. **[C]** S. Sobhan, **A. Saha**, T. A. Khan, A. Zami, *"Skin Cancer Classification Using Pre-trained CNNs: A Transfer Learning Approach Addressing Imbalanced Data Challenges"*, published at the *2nd Int'l Conf. on Next-Gen Computing, IoT and Machine Learning (NCIM)*, June 2025. *[Link]*

5. **[C]** S. Sobhan, A. Zami, M. Ahmed, T. M. Zihan, T. A. Khan, **A. Saha**, *"A Multi-Stage Deep Learning Approach to Tuberculosis Detection with Explainable Insights"*, published at the *2nd Int'l Conf. on Next-Gen Computing, IoT and Machine Learning (NCIM)*, June 2025. *[Link]*

Research Experience

Multi-Sensor Fusion-Based Attention Scheduling Framework for Autonomous Driving *Remote Collaboration*
Feb 2025 Current

- Exploring fusion approaches for signals captured from LiDAR, Radar, and Camera sensors in autonomous driving scenarios. Investigating attention scheduling mechanisms for fused multi-sensor images/signals to enhance perception efficiency.
- *Collaborator:* Md. Iftekharul Islam Sakib, Asst. Professor, CSE, BUET

Development of a Multimodal Medical Assistance Chatbot for Domain-Specific Applications *Dhaka, Bangladesh*
Nov 2023 Mar 2025
Undergraduate Thesis

- Developed a multimodal medical assistance chatbot for dermatology by fine-tuning a vision-language model on the Dermnet dataset; implemented GRPO and DPO for structured reasoning and conversational alignment, integrated DINOv2 and knowledge graphbased RAG for diagnostic precision, and applied structured pruning for efficient deployment.
- *Research Supervisor:* Dr. Mohammad Ariful Haque, Professor, EEE, BUET *Presentation:* Slides

Selected Projects

Efficient Frame Selection for Long Egocentric Video Understanding [Ongoing] GitHub

- *Improves the VIDEOTREE method by introducing progressive feature matching using CLIP, reducing the required frames from 63.2 to 12 on the Egoschema dataset in a training-free manner.*

EchoLens: Multimodal Conversational AI Engine GitHub

- *A FastAPI-based multimodal engine integrating SmolVLM for vision-language reasoning, OpenAI Whisper for speech-to-text, and pyttsx3 for text-to-speech with persistent conversational memory.*

Simple MedQA-GPT: GPT Tailored for Medical Q&A GitHub

- *A fine-tuned GPT-2 model trained on a custom medical JSONL dataset using Hugging Face Trainer and deployed as a Dockerized REST API via FastAPI for clinical question-answering.*

MATLAB-Based Fingerprint Recognition System GitHub Report

- *Executes fingerprint identification via minutiae-based matching, employing a pipeline of Fourier Transform enhancement, locally adaptive binarization, and an iterative parallel thinning algorithm.*

Competition

- **1st Runner Up - Poster Competition (AI)**
  Poster Title: *AI-Powered Dermatological Assistant: Bridging Healthcare Gaps Through Multimodal Intelligence* [Poster]
  BEAR Summit - Bangladesh National Semiconductor Symposium 2025 [Certificate]

Professional Experience

Advanced Chemical Industries Ltd. [Website] *Dhaka, Bangladesh*
Machine Learning Engineer *Apr 2025 Present*
Office Projects:

- **CV Sorter:** LLM-Powered automated CV evaluation system for scoring candidates.
- **Insight Explorer:** LLM-powered analysis of tabular data to uncover trends and patterns.
- **Bangla OCR:** Conversion of printed and handwritten Bengali text into machine-readable format.
- **AI-powered generic drug formulation:** An AI platform at ACI Healthcare to accelerate generic drug development, and reduce manual effort. [Ongoing]

Extracurricular Experience

Robotics Bootcamp 2025 [Website] *Dhaka, Bangladesh*
Instructor, Institute of Robotics and Automation, BUET *June 2025*

- Delivered a lecture on *PID Control for Robotics*, introducing feedback control fundamentals, PID components, and tuning methods with practical analogies.

Association for Computing Machinery (ACM) [Website] *Remote*
Student Executive, ACM SIGCOMM *Apr 2024 Feb 2025*

- Appointed as the first-ever Student Executive, working with Dr. Matthew Caesar (UIUC) to lead global networking initiatives, develop the official SIGCOMM website, and co-found the SIGCOMM paper reading group where I presented research.

Technical Skills

- **Hardware:** Microcontrollers, IoT Devices, Sensors.
- **Circuit Simulation and Design:** PSpice, LTSpice, Proteus.
- **Programming:** Python, MATLAB, C/C++, Pandas, NumPy.
- **ML/DL/NLP:** PyTorch, TensorFlow, Hugging Face Transformers, CNNs.
- **DevOps & Tools:** Docker, FastAPI, Git, LaTeX, Microsoft Office.

Honors and Awards

- **University Merit Scholarship** (4 semesters) BUET, for outstanding academic performance
- **Dean's List Award** (Years 1-2) BUET, for high cumulative GPA achievement
- **29th Rank out of 10,000+** candidates in BUET Undergraduate Admission Test (2019)
- **31st Rank (Male Category) out of 300,000+** in Dhaka Board HSC; **Talent Pool Scholarship** recipient with 96.83% in Physics, Chemistry, Mathematics and 91.15% overall
- **Perfect Attendance Certificate** Notre Dame College, for flawless attendance during Classes 11-12